Summary

Health risk assessment of chemical substances from removing of old environmental loads

Introduction. Hazardous wastes from refineries stored in lagoons are old environmental loads. One way of remediation is to extract and process this waste to an alternative fuel. Emissions of harmful substances released into the atmosphere during extraction and processing of waste can negatively affect the health of exposed persons.

Aim of this study was to evaluate the potential level of health risks from remediation of old environmental loads based on the detected concentration levels of selected substances in the air and to build a view of potential health risk stratification in the wider area.

Methods. Among the contaminants were monitored sulphur dioxide, toluene, hydrogen sulphide and 16 representatives of PAHs (acenaphthene, acenaphtylene, anthracene, benz[a]anthracene, dibenz(ah)anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[ghi]perylene, benzo[a]pyrene, fluoranthene, fluorene, chrysene, indeno[1,2,3-cd]pyrene, naphthalene phenanthrene, and pyrene). For that purpose was used combination of air pollutant concentrations and the dispersion model of substances in environment. The monitoring of contaminants was realized in the place of old environmental loads and in the nearby residential area. The zones of concentrations were modelled by using air dispersion program "SYMOS´97". The resulting data on the stratification levels of health risks in the area were evaluated after conversion expressed graphically. The health risk was characterized in a form of the hazard quotient (HQ) at substances with threshold effect and the individual lifetime cancer risk above the normal level in the population (ILCR) at carcinogens.

Results. The highest levels of air pollution contributions of all monitored substances were found in the extraction and processing of waste. Majority contributions were sulfur dioxide (in the occupational and non-occupational environment). It found increased health risks of air pollution of sulfur dioxide contributions for occupational exposure. Also in the residential zone of air pollution from sulfur dioxide contributions by the remediation occasionally exceeded the recommended level of risk. Health risks of air pollution contributions toluene, hydrogen sulfide and a mixture of PAHs (the equivalent of benzo[a]pyrene) can be assessed as low to insignificant in both occupational and non-occupational exposure. In the case of health risk assessment of the total exposure (the sum of the air pollution background levels) was found increased health risk for non-occupational exposure to sulfur dioxide and mixtures of PAHs (the equivalent of benzo[a]pyrene).

Conclusions. Health risks associated with technology disposal of old environmental loads are among the current problems of public health services. The present work provides new information on the potential extent of the burden of the organism exposed population. When estimating the risk for an exposed population in the wider area, method was the two-dimensional health risk stratification that makes the situation more transparent and relieves approaches of risk regulation. The presented procedure may take a general methodological character, usable in similar exposure scenarios.